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Express Mail Label No. EK611850375US
Date of Deposit: October 6, 2000

Attorney Docket No. 17556-057

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Cristian M. Hera et al.
Serial No.:	Not yet assigned
Filing Date:	October 6, 2000
Title:	INTERNET TELECONFERENCING

BOX: PATENT APPLICATION
Commissioner for Patents
Washington, D.C. 20231

PATENT APPLICATION TRANSMITTAL LETTER

Sir:

Enclosed are:

[X] Specification (13 pages); Claims (4 pages) and Abstract (1 Page)

[X] Four (4) Sheets of Drawings - (Figs. 1-5) (Informal)

[] Assignment of Invention to:

[] Assignment Recordation Form Cover Sheet (Form PTO-1595)

[] Verified Statement To Establish Small Entity Status

[] Certified Copy of _____ Application No. _____

[] Associate Power of Attorney

[X] Declaration and Power of Attorney [X] Signed [ ] Unsigned

[] Information Disclosure Statement and Form PTO-1449

[] _____

Express Mail Label No. EK611850375US
Date of Deposit: October 6, 2000

CLAIMS AS FILED

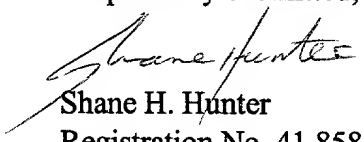
For	Number Filed		Number Extra	Rate		Basic Fee
						$ 710.00
Total Claims	20	- 20	0	$ 18	=	$ 0
Independent Claims	4	- 3	1	$ 78	=	$ 80.00
Multiple Dependent Claims	0			$260	=	0
Non-English Language Specification			No	$130	=	0
Reduction by 50% for filing by small entity:						- $0
				TOTAL FILING FEE	=	$ 790.00

[] Please charge my Deposit Account No. 50-0311 in the amount of $ _____.

[X] A check in the amount of **$ 790.00** to cover the total filing fee is enclosed.

[X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit overpayment to Account No. 50-0311, Ref. No. 17556-057. A duplicate copy of this transmittal is enclosed.

Respectfully submitted,



Shane H. Hunter
Registration No. 41,858
Attorneys for Applicant
MINTZ, LEVIN, COHN, FERRIS,
GLOVSKY and POPEO, P.C.
One Financial Center
Boston, MA 02111
Tele: 617/542-6000

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TRANSMITTAL LETTER

Sir:

Enclosed herewith for filing in the above-identified patent application are the following documents:

1. Patent Application Transmittal Letter;
2. Patent Application including Specification, Claims and Abstract;
3. Four (4) Sheets of Informal Drawings (Figs. 1-5);
4. Declaration and Power of Attorney;
5. Check in the amount of $790.00 to cover the requisite filing fee; and
6. Return Postcard.

In connection with the foregoing matter, please charge any additional fees which may be due, or credit any overpayment, to Deposit Account Number 50-0311, Reference 17556-057. A duplicate copy of this letter is provided for this purpose.

Respectfully submitted,

Shane H. Hunter
Registration No. 41,858
Attorneys for Applicant
MINTZ, LEVIN, COHN, FERRIS,
GLOVSKY and POPEO, P.C.
One Financial Center
Boston, MA 02111
Tele: 617/542-6000

Date: October 6, 2000

CERTIFICATE OF EXPRESS MAILING UNDER 35 C.F.R. 1.10

"Express Mail: Mailing Label Number EK611850375US. Date Of Deposit: October 6, 2000.
I hereby certify that this paper or fee (or any paper or fee referred to as being enclosed) is being deposited with the U.S. Postal Service "Express Mail Post Office to Addresses" service under 37 C.F.R. 1.10 on the date indicated above and is addressed to the Box: Patent Application, Commissioner for Patents, Washington, D.C. 20231

Shane H. Hunter, Registration No. 41,858

Attorney Docket No. 17556-057 October 6, 2000

APPLICATION

FOR

UNITED STATES LETTERS PATENT

SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

Be it known that **Cristian M. Hera, a Romanian Citizen** of **Framingham, Massachusetts, Bruce C. Levens, a U.S. Citizen** of **Wayland, MA, and R. Brough Turner, a U.S. Citizen** of **Newton Corner, Massachusetts** have invented certain improvements in a **INTERNET TELECONFERENCING** of which the following description in connection with the accompanying drawings is a specification, like reference characters on the drawings indicating like parts in the several figures.

FIELD OF THE INVENTION

This invention relates to teleconferencing and more in particularly to conference calling over packet-based networks.

BACKGROUND OF THE INVENTION

Teleconferencing is a very popular means of communication in today's society. Persons in different locations, e.g., in the building next door, down the street, across the state or around the world, can communicate audibly and sometimes visually in the same conference by means of conference calling. In the typical conference call, multiple persons communicate over multiple lines that are all interconnected and carry all participants' voices. Because all persons can be speaking at a given time, and noise or other sounds from all sources are received by all participants, it can be difficult to distinctly hear the loudest talkers clearly.

Teleconferencing can be accomplished using a variety of techniques. For example, one of the participants in the call can originate multiple calls to the respective parties to be involved in the conference call. Alternatively, the participants may all call a common teleconferencing service that connects all of the incoming calls, for a particular conference, to each other. Audio and visual information for teleconferences can be carried over packet-based networks such as the global packet-based network known as the Internet.

Referring to FIG. 1, previous systems have used a conference bridge that received

and output packetized data. Packetized data representing speech from N talkers was received and decoded by decoders. The decoded signals were transmitted to logic that selected the L loudest talkers. The signals for the L loudest talkers were mixed in the conference bridge and encoded and packetized. The encoded and packetized data were sent over a packet-data network toward receivers.

SUMMARY OF THE INVENTION

In general, in one aspect, the invention provides a conferencing system including an input configured to receive N encoded speech signals from N terminals, and a signal processing arrangement configured to determine L encoded signals, of the N encoded speech signals, each indicative of an amount of sound that is louder than amounts of sound indicated by signals of the N encoded signals other than the L signals, the signal processing arrangement being further configured to produce at least N minus L sets of signals similar to the L signals and to transmit at least a set of the similar signals toward each of the terminals other than the terminals from which the L signals were received.

Implementations of the invention may include one or more of the following features. The signal processing arrangement is configured to determine the L signals based on amounts of energy in the N signals. The signal processing arrangement is configured to transmit a reduced set of signals toward each of the terminals from which the L signals are received, the reduced set including the L similar signals minus the signals similar to the signals received from the terminals toward which the reduced set is being transmitted. The signal processing arrangement is configured to transmit the

signals toward the terminals in an unmixed format.

The N signals include packets having data portions and headers, and the signal processing arrangement is configured to alter the headers of the packets to transmit the packets toward appropriate terminals.

In general, in another aspect, the invention provides a method including receiving N encoded first telecommunications signals from N terminals, selecting L loudest signals from the N signals, producing second telecommunications signals that are similar to the L signals, and transmitting the second signals toward the terminals other than the terminals from which the L signals were received.

Implementations of the invention may include one or more of the following features. The method further includes determining the L signals based upon amounts of energy in the N signals. The method further includes transmitting, toward each of the terminals from which the L signals were received, the second signals minus each of the second signals similar to the signals received from the respective terminals. The second signals are transmitted toward the terminals in an unmixed format. The first signals contain RTP packets having data portions and headers, the method further comprising altering the headers. L equals one.

In general, in another aspect, the invention provides a conferencing system including an input configured to receive N encoded first speech signals from N terminals, means for selecting L loudest signals from the N signals and producing second telecommunications signals that are similar to the L signals, and an output device configured to transmit, toward the terminals, the second signals.

Implementations of the invention may include one or more of the following features. The output device is configured to transmit the second signals except the second signals, if any, associated with the first signals received from the respective terminals toward which the second signals are transmitted. L equals one. The output device is configured to transmit the second signals in an unmixed format toward the terminals.

In general, in another aspect, the invention provides a computer program product, residing on a computer-readable medium, including instructions for causing a computer to receive N encoded first telecommunications signals from N terminals, select L loudest signals from the N signals, produce second telecommunications signals that are similar to the L signals, and transmit the second signals toward the terminals from which the signals of the N signals other than the L signals were received.

Implementations of the invention may include one or more of the following features. The computer program product further includes instructions for causing a computer to determine the L signals based upon amounts of energy in the N signals. The computer program product further includes instructions for causing a computer to transmit, toward each of the terminals from which the L signals were received, the second signals minus the second signal similar to the signal received from the respective terminal. The instructions for causing the computer to transmit the second signals are configured to cause the computer to transmit the second signals toward the terminals in an unmixed format. The first signals contain RTP packets having data portions and headers, the computer program product further comprising instructions for causing a

computer to alter the headers.

Various aspects of the invention may provide one or more of the following advantages. Delay of teleconferencing signals can be reduced compared to techniques that encode and decode at a conference bridge. Speech quality of transmitted telecommunication signals can be improved compared to techniques employing decoding and encoding at a conference bridge. A conference bridge can process signals without decoding or encoding the signals. Delay in telecommunications can be reduced compared to techniques that mix teleconferencing signals at a conference bridge. A conference bridge can process signals without mixing the signals or encoding mixed signals.

These and other advantages of the invention, along with the invention itself, will be more fully understood after a review of the following drawings, detailed description, and claims.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a block diagram of a prior art conference bridge.

FIG. 2 is a block diagram of a telecommunications system according to the invention.

FIG. 3 is a simplified block diagram illustrating communication between a conference bridge and terminals shown in FIG. 2.

FIG. 4 is a functional block diagram of the conference bridge shown in FIG. 2.

FIG. 5 is a block diagram flow chart of a teleconference process according to the

invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Embodiments of the invention provide techniques for processing telecommunications data for conference calling. Multiple calls are connected through lines to an Internet Protocol (IP) conference bridge. The conference bridge determines which of the incoming calls are the loudest. The L (where L is an integer) loudest signals are selected and transmitted from the conference bridge. The L loudest signals are sent to the participants in the teleconference that are not among the L loudest callers. The L loudest callers receive each of the L signals except the signal originating from itself. This helps prevent undesired echo from being received by the L loudest callers.

Referring to FIG. 2, a telephony system 10 includes IP terminals 12_1, 12_2, ...12_N, and a Packet-based communications network 32, here the global packet-based network known as the Internet including a conferencing bridge 34. While only five terminals 12 are shown in FIG. 2, more, or fewer, terminals 12 may participate in a teleconference according to the invention. The terminals 12 are connected for bi-directional communication with the Internet 32 and are configured to communicate with the Internet 32 in a digital format. The conference bridge 34 is coupled for bi-directional communication in a digital format with the terminals 12 via the Internet 32.

The terminals 12 are configured to transmit information to the conference bridge 34 and to receive multiple lines of communication from the conference bridge 34, each line carrying a signal. Each terminal 12 may include a mute capability that enables a user

to mute (e.g., by pushing a mute button) the terminal 12 such that the terminal 12 does not transmit a signal or transmits a null signal. Each terminal 12 also includes an encoder to encode the information transmitted to the conference bridge 34. The encoders of different terminals 12 can encode packets of different frame sizes. Also, the encoder for a terminal 12 can be different than the encoder(s) of other terminals 12, and encode data differently than other encoders. Each terminal 12 also includes a jitter buffer to help accommodate for different arrival times of incoming packets. The terminals 12 are configured to use the jitter buffer to help convert incoming asynchronous packet data, including bursts of packet data, to synchronous output data. Each terminal 12 also has at least one decoder to decode incoming data. Each terminal 12 can have a group of decoders configured to decode data encoded by the different encoder types of the terminals 12. A mixer 36 included in each of the terminals 12 is configured to mix the decoded incoming signals by summing the decoded incoming signals.

The conference bridge 34 is an IP system including appropriate processing apparatus. The system includes a central processing unit (CPU) configured to perform the functions described below related to determining/selecting loudest signals, replicating the loudest signals and transmitting replicated signals. Here, this CPU is a programmed Digital Signal Processor (DSP). Alternatively, the CPU could be a general purpose processor such as a Reduced International Set Computer (RISC) processor or an, e.g., IBM-compatible processor such as a Pentium® processor. Alternatively still, the CPU can be implemented using a dedicated Application-Specific Integrated Circuit (ASIC).

Referring to FIG. 3, the conference bridge 34 is schematically shown coupled to

several, here N, terminals 12_1, 12_2, ..., 12_N. The representation shown in FIG. 3 is schematic in that the conference bridge 34 is shown directly coupled to the terminals 12, although the connection is in reality not a direct connection for the system 10 as shown in FIG. 2. For purposes of the following discussion, however, it is sufficient to view the connections between the conference bridge 34 and the terminals 12 as direct connections. As shown, each of the terminals 12 is coupled and configured to transmit a signal from the terminal 12 to the conference bridge 34 as indicated by arrows 40_1, 40_2,... 40_N. The conference bridge 34 is also coupled to the terminals 12 to transmit L signals of information to the terminals 12 as indicated by arrows 42, 44, 46. The L represents a number that is equal to or smaller than the number N. Thus, the conference bridge 34 is configured to receive N signals and convey a set, that may be a subset, of those signals to the terminals 12, where the set contains L signals. For L of the terminals 12, only one shown here, L -1 signals are conveyed to that terminal 12, here terminal 12_N. This helps prevent echoes at certain of the terminals 12 as described more fully below.

The conference bridge 34 is configured to process signals received from the terminals 12 and return signals to the terminals 12. The bridge 34 is configured to return signals to the terminals 12 similar to how they arrive at the bridge 34. Thus, if a burst of packets is received by the bridge 34, then a burst of data is output by the bridge 34 (if the burst is associated with one of the loudest signals). The terminals 12 are configured to transmit one signal (or no signal, e.g., if the terminal 12 is muted) of information to the conference bridge 34, and to receive up to L signals of information from the conference bridge 34. The terminals 12 are configured to mix the incoming signals from the

conference bridge 34 by summing the incoming signals. The conference bridge 34 is configured to receive N encoded signals from the N terminals 12 at an input. The CPU in the conference bridge 34 is coupled to the input of the conference bridge to receive the N signals. The CPU is programmed to process the N signals and return L signals to N - L of the terminals 12 and return L - 1 signals to L of the terminals 12.

Referring to FIG. 4, the conference bridge 34 can be divided into functional blocks of a line selector 48 and a replicator 50. The selector 48 is connected and configured to transmit L signals to the replicator 50. The selector 48 and replicator 50 can be implemented in the specially-programmed DSP to process the N incoming signals.

The selector 48 is configured to compute the amounts of energy in the N incoming signals. For example, the selector 48 can extract data indicative of the energy of the incoming signals from the bit stream representing the encoded signals, or by at least partially decoding the incoming signals, regardless of the frame sizes of the data. Other techniques for extracting energy data may be employed depending on the type of coding of the incoming signals. The selector 48 is configured to average the amounts of energy of the incoming signals over time t_1 with samples every t_2. Thus, the selector 48 can sample the energy of each of the N incoming signals every t_2 and average the sampled energies over approximately t_1.

The selector 48 is further configured to analyze the average amount of energy of the N incoming signals and select the L signals indicative of the loudest talkers at the respective terminals 12. The selector 48 can use the average energy levels (e.g., by comparing the energies to a threshold) to determine which incoming signals contain

speech. To determine the signals of the loudest talkers, the selector 48 can, e.g., select the L signals having the L highest energy levels of the N incoming signals. The selector 48 is configured to select the L loudest signals by comparing the average amounts of energies over approximately a time t_3. Thus, the selector 48 can select the L signals having the highest average energy levels over approximately t_3 and transmit these signals to the replicator 50. The selector 48 is configured to select and transmit L signals with the signals remaining in their encoded forms.

The times t_1, t_2, and t_3 are dependent on the application. For example, for operation on streams encoded using G.711, G.723.1, or G.729, t_1 can be 200ms, t_2 can be 10-30ms, and t_3 can be 500ms. Other times and applications are acceptable.

The replicator 50 is configured to replicate or multicast the L loudest incoming signals to form signals similar to the L input signals for transmission to the terminals 12 (FIG. 3). The original L signals may or may not be sent to the terminals 12. For example, the original L signals may be sent to at least one of the terminals 12, or they may be multicast to the N terminals 12, or they may be replicated and the replicas sent to the N terminals 12. If the original L incoming signals to the replicator 50 are used, they may be sent to one of the terminals 12, with the original signals being multicast or replicated and transmitted to the remaining N - 1 terminals 12. In any case, signals similar (including identical to) the L incoming signals are transmitted to the terminals 12.

The replicator 50 is configured to selectively send signals to the terminals 12. The replicator 50 is configured to send L similar signals to N - L terminals 12 that are not sources of the L loudest signals. The replicator 50 is further configured to send L - 1 of

the similar signals to each of the L terminals 12 that were sources of the L loudest signals. For the terminals 12 that originated the L loudest signals, the replicator 50 is configured to send each of the L similar signal except the similar signal corresponding to the signal originating from the respective terminal 12 (i.e., except to the sender of the suppressed/withheld signal. This guards against sending echo signals to the terminals 12 that originate the L loudest signals at any given time.

Referring in particular to FIG. 5, with additional reference to FIGS. 2-4, a telecommunications process 60 starts at stage 62 and proceeds to stage 64 where data are received. The data are received by the conference bridge 34 from the terminals 12 through associated Internet 32 apparatus. The data are received by the conference bridge 34 from N terminals 12.

At stage 66, the selector 48 of the conference bridge 34 finds the input channels where speech is present. The selector 48 determines and analyzes the amounts of energy in the N signals received on the channels. The selector 48 samples the incoming signals approximately every t_1 and averages the sampled amounts of energy over approximately t_2. From these averaged amounts of energy, the selector 48 determines, e.g., by comparing the average energy amounts to a threshold, which of the N channels contains speech currently. This threshold can be variable and can be computed at call set up based, e.g., on the average energy on each channel to the conference bridge 34.

At stage 68, the selector 48 determines and selects the L loudest input signals. The selector 48 compares average energy amounts of the signals having speech on them over approximately t_3, and selects the L signals having the most average energy over the

approximately t_3 time period. The selector 48 transmits the selected L loudest signals to the replicator 50.

At stage 70, the replicator 50 replicates the L loudest signals received from the selector 48 to produce similar signals (similar to the L loudest signals) for transmission to the terminals 12. The replicator 50 transmits L signals similar to the L received signals to each of the terminals 12 that did not originate one of the selected L loudest signals. To each of the terminals 12 that originated one of the selected loudest signals, the replicator 50 transmits each of the L similar signals except the similar signal corresponding to the signal that originated from the terminal 12 to which the set of L - 1 signals is transmitted. Instead of replicating the incoming L signals, the replicator 50 can multicast the incoming signals to the terminals 12, with or without transmitting the received L signals to one or more of the terminals 12.

Other embodiments are within the scope and spirit of the appended claims. For example, the terminals 12 could be configured to transmit more than one signal. Also, the system 10 can be adapted for video conferencing. In this case, the terminals may be configured to provide and display video images. A video image provided to the N terminals may be from the terminal of the loudest user, or multiple images may be provided to from the terminals of the L loudest users to the N terminals. In either case, the terminal providing an image to be provided to other terminals need not receive the image from the conference bridge.

What is claimed is:

1. A conferencing system comprising:

an input configured to receive N encoded speech signals from N terminals; and

a signal processing arrangement configured to determine L encoded signals, of the N encoded speech signals, each indicative of an amount of sound that is louder than amounts of sound indicated by signals of the N encoded signals other than the L signals, the signal processing arrangement being further configured to produce at least N minus L sets of signals similar to the L signals and to transmit at least a set of the similar signals toward each of the terminals other than the terminals from which the L signals were received.

2. The system of claim 1 wherein the signal processing arrangement is configured to determine the L signals based on amounts of energy in the N signals.

3. The system of claim 2 wherein the signal processing arrangement is configured to transmit a reduced set of signals toward each of the terminals from which the L signals are received, the reduced set including the L similar signals minus the signals similar to the signals received from the terminals toward which the reduced set is being transmitted.

4. The system of claim 3 wherein the signal processing arrangement is configured to transmit the signals toward the terminals in an unmixed format.

5. The system of claim 1 wherein the N signals include packets having data portions and headers, and the signal processing arrangement is configured to alter the

headers of the packets to transmit the packets toward appropriate terminals.

6. A method comprising:

receiving N encoded first telecommunications signals from N terminals;

selecting L loudest signals from the N signals;

producing second telecommunications signals that are similar to the L signals; and

transmitting the second signals toward the terminals other than the terminals from which the L signals were received.

7. The method of claim 6 further comprising determining the L signals based upon amounts of energy in the N signals.

8. The method of claim 6 further comprising transmitting, toward each of the terminals from which the L signals were received, the second signals minus each of the second signals similar to the signals received from the respective terminals.

9. The method of claim 6 wherein the second signals are transmitted toward the terminals in an unmixed format.

10. The method of claim 6 wherein the first signals contain RTP packets having data portions and headers, the method further comprising altering the headers.

11. The method of claim 6 wherein L equals one.

12. A conferencing system comprising:

an input configured to receive N encoded first speech signals from N terminals;

means for selecting L loudest signals from the N signals and producing second telecommunications signals that are similar to the L signals; and

an output device configured to transmit, toward the terminals, the second signals.

13. The system of claim 12 wherein the output device is configured to transmit the second signals except the second signals, if any, associated with the first signals received from the respective terminals toward which the second signals are transmitted.

14. The system of claim 12 wherein L equals one.

15. The system of claim 12 wherein the output device is configured to transmit the second signals in an unmixed format toward the terminals.

16. A computer program product, residing on a computer-readable medium, comprising instructions for causing a computer to:

receive N encoded first telecommunications signals from N terminals;

select L loudest signals from the N signals;

produce second telecommunications signals that are similar to the L signals; and

transmit the second signals toward the terminals from which the signals of the N signals other than the L signals were received.

17. The computer program product of claim 16 further comprising instructions for causing a computer to determine the L signals based upon amounts of energy in the N signals.

18. The computer program product of claim 16 further comprising instructions for causing a computer to transmit, toward each of the terminals from which the L signals were received, the second signals minus the second signal similar to the signal received from the respective terminal.

19. The computer program product of claim 16 wherein the instructions for causing the computer to transmit the second signals are configured to cause the computer to transmit the second signals toward the terminals in an unmixed format.

20. The computer program product of claim 16 wherein the first signals contain RTP packets having data portions and headers, the computer program product further comprising instructions for causing a computer to alter the headers.

ABSTRACT OF THE INVENTION

A conferencing system includes an input configured to receive N encoded speech signals from N terminals, and a signal processing arrangement configured to determine L encoded signals, of the N encoded speech signals, each indicative of an amount of sound that is louder than amounts of sound indicated by signals of the N encoded signals other than the L signals, the signal processing arrangement being further configured to produce at least N minus L sets of signals similar to the L signals and to transmit at least a set of the similar signals toward each of the terminals other than the terminals from which the L signals were received.

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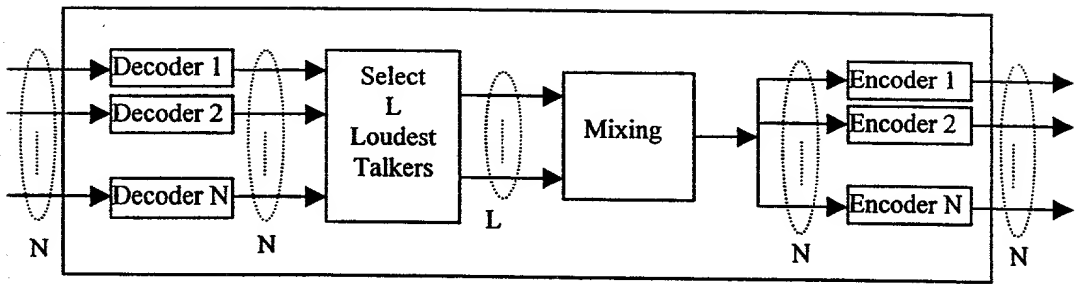

FIG. 1

(Prior Art)

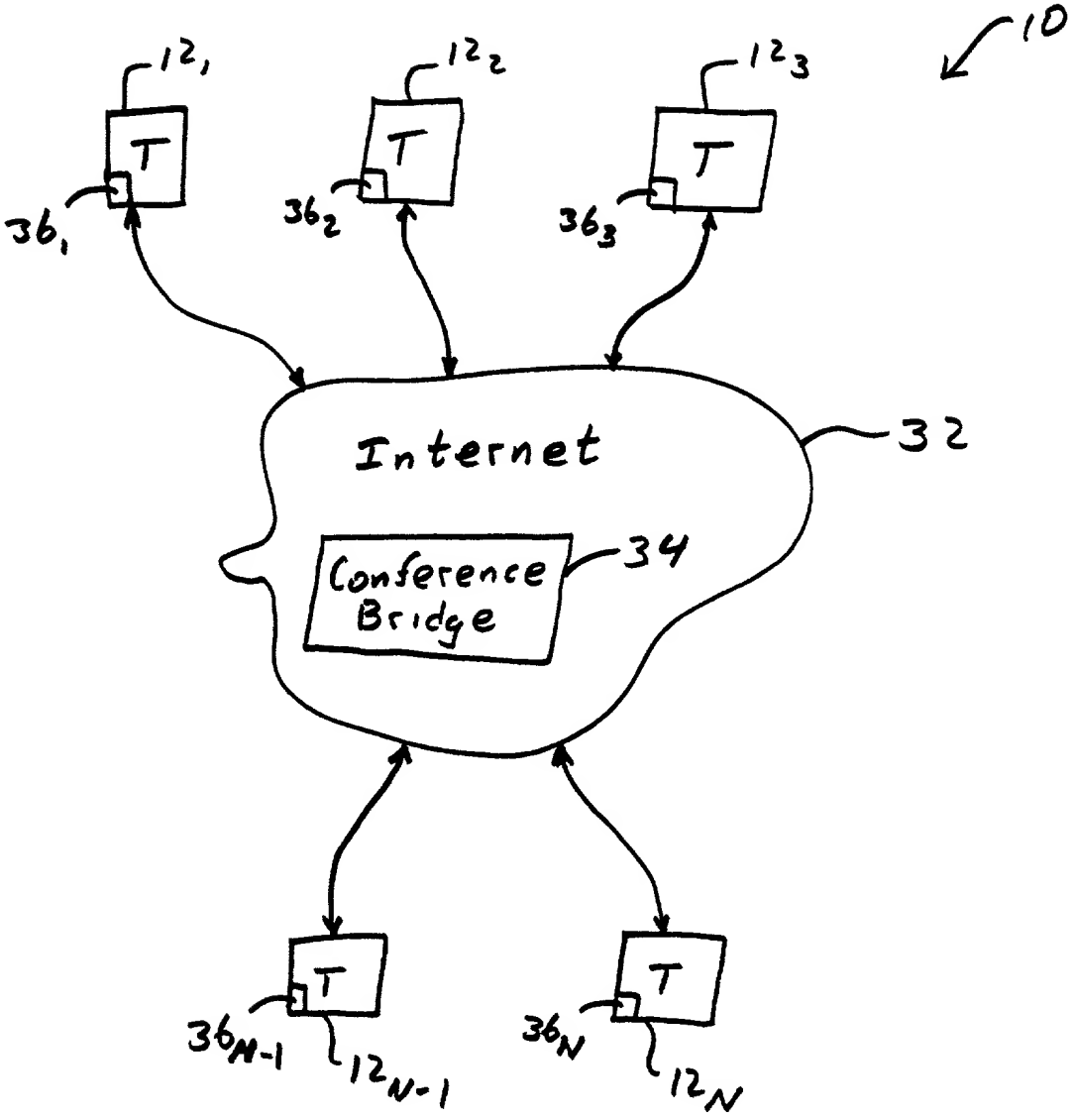
10
12,
12,
12,
T
T
T
36,
36,
36,
Internet
32
Conference
Bridge
34
T
T
36N-1
12N-1
36N
12N

FIG. 2

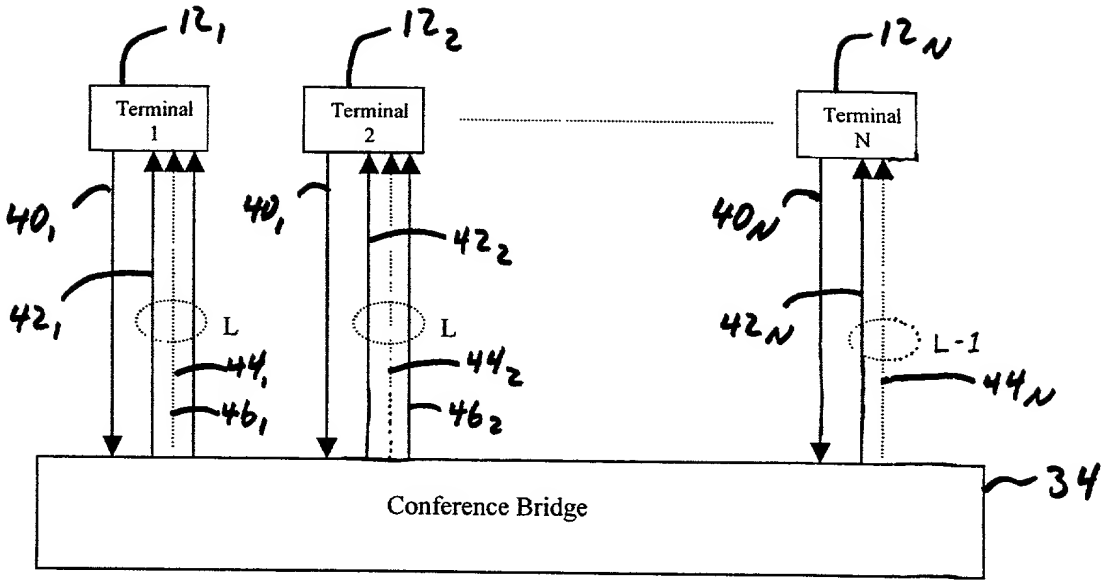
12₁
12₂
12N
Terminal 1
Terminal 2
Terminal N
40₁
40₁
40N
42₁
42₂
42N
L
L
L-1
44₁
44₂
44N
46₁
46₂
Conference Bridge
34

FIG. 3

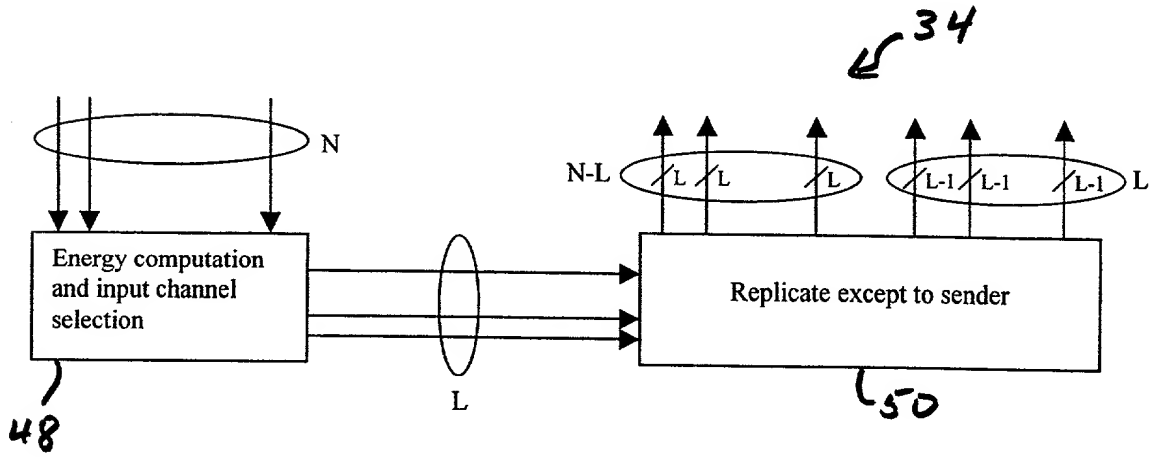
34
N
N-L
L
L
L
L-1
L-1
L-1
L
Energy computation and input channel selection
Replicate except to sender
L
48
50

FIG. 4

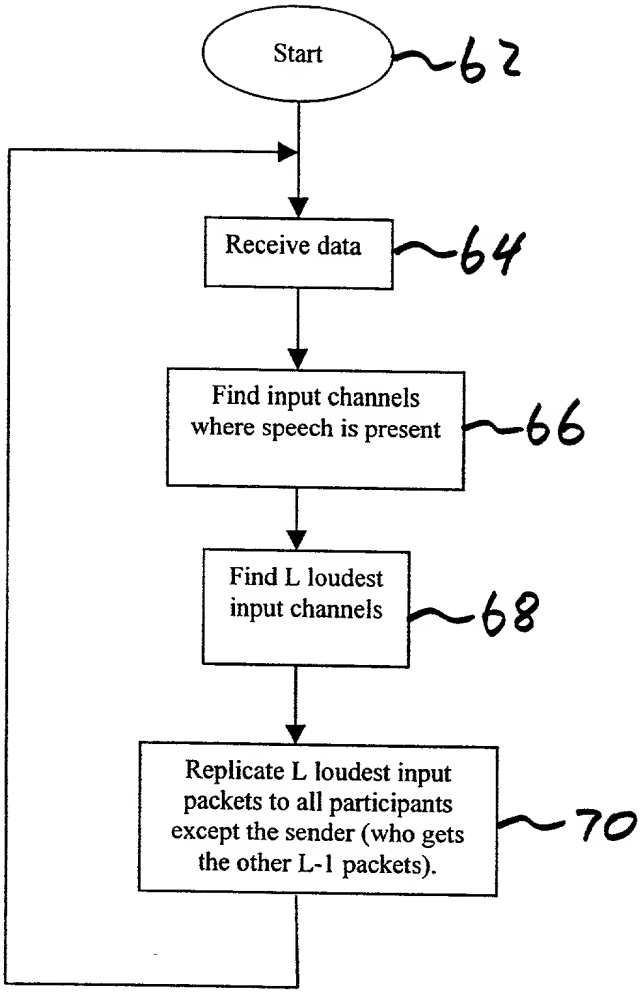
Start
62
60
Receive data
64
Find input channels where speech is present
66
Find L loudest input channels
68
Replicate L loudest input packets to all participants except the sender (who gets the other L-1 packets).
70

FIG. 5

Express Mail Label No.: EK611850375US
Date of Deposit: October 6, 2000

Attorney Docket No. 17556-057

COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and sole inventor of the subject matter (an original, first and joint inventor) which is claimed and for which a utility patent is sought on the invention entitled:

INTERNET TELECONFERENCING

the specification of which:

☐ was filed on _____, as United States non-provisional application U.S.S.N. _____, bearing Attorney Docket No. _____.

☒ is attached hereto.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

☐ I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application designating at least one country other than the United States listed below and have also identified below any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Appln. Number	Country *(if PCT, so indicate)*	Filing Date *(dd/mm/yy)*	Priority Claimed	
			Yes	No
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐

☐ I hereby claim the benefit under Title 35, United States Code, § 119(e) or §120 of any United States application(s), or §365(c) of any PCT International application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

Application No. *(U.S.S.N.)*	**Filing Date** *(dd/mm/yy)*	**Status** *(Patented, Pending, Abandoned)*

PCT International Applications designating the United States:

PCT International Application No.	**PCT Filing Date**	**Status**

I hereby appoint the following attorneys and/or agents to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Attorney or Agent	**Registration No.**	**Attorney or Agent**	**Registration No.**
Kevin Ainsworth	39,586	Kristin E. Konzak	44,848
Ingrid Beattie	42,306	Cynthia Kozakiewicz	42,764
David B. Bernstein	32,112	Barry Marenberg	40,715
Naomi Biswas	38,384	William Marino	44,219
David F. Crosby	36,400	Leslie Meyer-Leon	37,381
James G. Cullem	43,569	A. Jason Mirabito	28,161
Brett N. Dorny	35,860	Michel Morency	Limited Recognition
Marianne Downing	42,870	Bradley Olson	40,750
Ivor R. Elrifi	39,529	Carol H. Peters	45,010
Heidi A. Erlacher	45,409	John T. Prince	43,091
Christina Gadiano	37,628	Michael Renaud	44,299
John A. Harre	37,345	Brian Rosenbloom	41,276
Shane Hunter	41,858	Thomas M. Sullivan	39,392
David E. Johnson	41,874	Howard Susser	33,556
Kris Kalidindi	41,461	Shelby J. Walker	45,192
Christina Karnakis	45,899	Martin M. Zoltick	35,745
Robert Klauzinski	42,742		

all of MINTZ, LEVIN, COHN, FERRIS, GLOVSKY AND POPEO PC, One Financial Center, Boston, Massachusetts 02111, as Applicant's attorneys with full power of substitution and revocation to take any and all action necessary with regard to the above-identified patent.

Address all telephone calls to Shane H. Hunter at telephone number 617/348-1765.
Address all correspondence to:

Shane H. Hunter, Esq.
Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C.
One Financial Center
Boston, Massachusetts 02111

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or patent issued thereon.

Cristian M. Hera — October 3, 2000

Inventor's Signature — Date
Full Name of Inventor: Cristian M. Hera
Citizenship: Romania
Residence: Framingham, Massachusetts
Post Office Address: 87 Georgetown Drive, Framingham, MA 01702

Bruce C Levens — October 3, 2000

Inventor's Signature — Date
Full Name of Inventor: Bruce C. Levens
Citizenship: U.S.A.
Residence: Wayland, Massachusetts
Post Office Address: 17 Timber Lane, Wayland, MA 01778

R. Brough Turner — October 3, 2000

Inventor's Signature — Date
Full Name of Inventor: R. Brough Turner
Citizenship: U.S.A.
Residence: Newton Corner, Massachusetts
Post Office Address: 91 Park Street, Newton Corner, MA 02158